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PUBLIC HEALTH REPORTS.

HOOKWORM DISEASE IN ITS RELATION TO THE NEGRO.^a

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During the last seven years considerable literature has appeared in regard to hookworm disease in the United States, but nearly all of these articles treat of the malady as found in the white race. The present paper is prepared with special reference and relation to the negro.

CAUSE OF HOOKWORM DISEASE.

Hookworm disease is caused by the presence of small worms belonging to a group of roundworms known technically as *Uncinariinæ*. Two different kinds of hookworms occur in man. One of these is known popularly as the "Old World hookworm," the other as the "New World hookworm." Both of these parasites are known to occur in Africa, the home of the negro, and both have been found in the negro. The Old World hookworm is relatively rare in the United States, where the great majority of cases of infection must be attributed to the New World parasite.

The New World hookworm is known technically as *Necator americanus*, which means "the American murderer." This name was given to it because of the great number of deaths it causes, directly or indirectly. It is about one-fourth to one-half an inch long and about as thick as a small hairpin. It has hard cutting plates or jaws guarding the entrance to its mouth, with the aid of which the parasite fastens to the intestinal wall.

WHERE THE HOOKWORM LIVES.

In its adult stage the hookworm is found fastened to the lining membrane of the small intestine. It is also sometimes found in the stomach. It makes a wound, sucks the blood, and produces a poisonous substance which injures the person infected.

A person may harbor a few hookworms, or several hundreds, or several thousands, according to the amount of infection to which he has been subjected. As children are usually subject to infection more than are adults, the disease is usually more common in them.

^a This is an abstract of an address recently given before the Hampton Negro Conference at Hampton Institute, Hampton, Va.

HOW THE HOOKWORM DEVELOPS.

These parasites do not multiply in the intestine, as their eggs require oxygen in order to develop. It is important to recall that for every hookworm found in the bowels a separate germ (young worm) must enter the body.

The parasites in the bowels lay hundreds of eggs which are discharged by the patients in their stools. An ordinary stool from an infected person may contain thousands upon thousands of these eggs. This is an exceedingly important point to remember, for it is only through the discharges from the bowels that these eggs escape from the patients, and if all such discharges are properly disposed of hookworm disease can be stamped out of existence.

A few hours after the eggs are passed by the patient a young embryo develops in the egg and escapes from the egg shell. This tiny worm, which is scarcely visible to the naked eye, feeds for a few days. Within about a week it sheds its skin twice, in somewhat the same way that a snake sheds its skin. It now continues to live in the cast-off skin, but it takes no more food until it enters a person.

HOW THE HOOKWORM ENTERS HUMAN BEINGS.

The young worm may enter persons in two different ways. First, it may be swallowed in contaminated water or food. Secondly, it may bore its way through the skin. This second method of infection is doubtless the more common. The young hookworms in boring through the skin produce an attack of "ground itch" (also known as "foot itch," "footsore," "dew itch," "dew poison," etc.). *Thus "ground itch" is usually the first stage of hookworm disease.* It is quite generally believed that the wearing of shoes will prevent ground itch, and this popular belief is correct to a great extent, namely, so far as ground itch on the feet is concerned; wearing shoes will therefore *reduce* but not *eradicate* hookworm disease.

After entering the skin, these young worms make their way to the blood, and pass with the blood through the heart to the lungs. From the lungs the parasites pass up the windpipe, down the gullet, through the stomach, to the small bowels, where they gradually shed their skin two more times, become mature, and then begin their work of injuring the wall of the intestine, of sucking the blood, and of poisoning their victims.

FACTORS FAVORING HOOKWORM DISEASE.

There are certain factors which are especially favorable to the development of these parasites.

Climate.—Climate has an important influence on these worms. The hookworms which infest man require a certain amount of warmth in order to develop and on this account they thrive better in the South than in the North. Therefore, generally speaking, this disease is a tropical and subtropical malady. In the United States it is a southern disease, and its occurrence north of Maryland is exceptional. For practical purposes, we may say that the Potomac and the Ohio rivers form about the natural northern limit of its distribution, although some few cases do occur north of these streams.

Soil.—A loose soil, such as a sandy soil, is much more favorable to the development of the worms than is a hard, compact soil, such as clay.

Moisture and shade.—As the drying action of the sun is usually fatal to the worms when on the ground, shaded and moist localities are more favorable to the disease than are unshaded and dry localities.

SOIL POLLUTION.

It has been stated in the foregoing that the only way by which the hookworms' eggs escape from the patients is through the stools. As this is also the usual method by which the typhoid germs escape, it is seen that careless disposal of the body waste is favorable to the spread of both of these maladies. The contamination of the ground with disease germs is known as "soil pollution," and other things being equal, hookworm disease will increase in frequency as soil pollution increases, and will decrease as soil pollution decreases.

Exact studies have not as yet been conducted in this country, covering any great area in regard to the percentage of negroes infected with hookworm disease as compared with the white race in the same localities, but it is thoroughly established that hookworm disease does occur in the negro as well as in the white, and that in some countries it is especially common in the negro. The comparative statistics thus far available for Georgia and Florida show (in accord with what theory demands) that in our Southern States also hookworm disease is more common in the negroes than in the whites.

An examination of several hundred farms in North and South Carolina, Georgia, and Alabama shows that of the farms having no privies twice as many are occupied by negroes as by whites. This would indicate the negro to be a much more frequent soil polluter, and if he is infected with hookworm disease in equal proportion to the white race he will, because of his more frequent pollution of the soil, be a greater factor in the spread of the disease to others and its general dissemination throughout the community.

THE EFFECTS OF HOOKWORM DISEASE.

The effects of hookworm disease may be divided into the *direct* effects and *indirect* effects.

Direct effects.—Under the direct effects of this disease we may include the symptoms and deaths due directly to the infection. My experience has been chiefly among the whites and, in comparison, only to a limited extent among the negroes. Thus far I am persuaded that in reference to symptoms this infection is more severe on the white race than on the negro race, and this experience is in harmony with the observations of other workers. To put it into technical language, the negro (when compared with the white) presents a *relative immunity* to the direct effects of hookworm infection. This observation carries with it a very important thought, namely, that probably the negro race has had this disease for so many generations in Africa that it has become somewhat accustomed to it. This thought may be a very comforting one to the negro from one point of view, but from another viewpoint it must be decidedly disquieting to the white race, for it carries with it the thought that on an average, in the rural districts from the Potomac to the Gulf the 833 negroes to the 1,000 whites (found in eight States) represent *theo-*

retically 833 possible hookworm reservoirs who do not suffer so seriously from the direct effects of the malady, who are therefore not so likely to come under treatment, but who are likely to act as spreaders of the disease to the rest of the community; it also possibly indicates that the negro has brought hookworm disease with him from Africa and because of his soil pollution has spread it broadcast through the South, thereby killing thousands and causing serious disease among tens of thousands of others.

Whether this line of thought be considered justified or not, we must all frankly face the fact that the negro does have hookworm infection, and because of his insanitary habit of polluting the soil, especially in rural communities, his presence is a menace to others not only in respect to hookworm disease, but also in respect to all other diseases spread by soil pollution.

Among the symptoms due to the direct effect of hookworm infection the following are especially prominent:

In severe infections the patients may be underdeveloped both physically and mentally; they present an anæmia (often mistaken for malaria); the skin may be dry and tallow like; the hair is dry; the shoulder blades are often very prominent and the abdomen is frequently swollen ("pot-belly"); there is usually a tenderness in the pit of the stomach; in about half of the severe cases there are (or have been) ulcers on the shins; in about 90 per cent of the cases the patients have had "ground itch;" the hair in the armpits and on the pubis is frequently very scanty. Hookworm disease is the most frequent cause of "dirt eating." It is also the most common cause of anæmia found among farm and cotton-mill hands in the South. The patients are weak, and this weakness brings with it an indisposition to work, frequently interpreted as "laziness."

Indirect effects.—As this infection injures the intestinal wall, brings about an intestinal catarrh, and thus interferes with the digestion, it naturally increases the chances of death in case a person is infected at the same time with some other disease in which good nourishment is important for recovery. As hookworm infection decreases the number of red blood corpuscles, it also increases the chances of death in case a person is infected at the same time with some other disease in which a good supply of oxygen to the tissues is important for recovery. Since good nourishment and proper functioning of the blood are two of the most important factors in recovering from pulmonary tuberculosis (known commonly as consumption), it is to be expected that persons who have both tuberculosis and hookworm disease will stand less chance of recovery than will persons who have consumption but not hookworm disease. *In other words, hookworm infection has an indirect effect in increasing the death rate from pulmonary tuberculosis.* It has been estimated that it about doubles the chances for death in cases of this disease. Now, even admitting that the direct effects of hookworm infection on the negro are less than on the white, it is a suggestive combination of facts that the tuberculosis death rate is about three times as great in the negro as in the white (namely, 490.6 to 173.5 per 100,000).

It is evident, therefore, that the eradication of hookworm disease is of great importance to the negro in his fight against tuberculosis.

Quite recently some very important observations have been made in Manila upon the indirect effects of hookworm infection. When

the Americans took charge of Bilibid prison the death rate was 238 per 1,000 per year; by improving the sanitary conditions this death rate was reduced to about 75 per 1,000; here it remained stationary until it was discovered that a very high percentage of the prisoners were infected with hookworms and other intestinal parasites; then a systematic campaign was inaugurated to expel these worms, and when this was done the death rate fell to 13.5 per 1,000.

Although the death rate among our American negroes has not as yet been reduced in a similar way, it can not be doubted that a reduction of their hookworm infection would result in a reduction of their general death rate (from all causes), which, when compared with the death rate of the whites, is in the ratio of 29.6 to 17.3 per 1,000 per year for the registration area.

NEGRO EDUCATION AND HOOKWORM DISEASE.

Hookworm disease has a serious effect upon the mind and prevents children from fully and properly assimilating the education which the country is offering them. Hookworm children are apt to study and learn with difficulty. As I visit the country schools and pick out the children suffering from this malady, the teachers generally exclaim: "Why, Doctor, you have picked out the most stupid children in the class!" That same mental handicap which this disease places upon the white children seems also to rest upon the negro children, although, as already stated, my observations among the negroes are much less extensive than among the whites.

The point to be made is this: Because of the effects which this infection has upon the mind, the present soil pollution (which spreads the disease) so prevalent among the negroes is necessarily resulting in a severe handicap in the mental advancement of the negro children.

As nearly as can be estimated (admittedly a rough estimate) the physical condition of the southern country school children with whom I come in contact is such that they can not possibly assimilate much over 70 per cent of the education they receive; in other words, somewhere about 30 per cent of the educational efforts are wasted, and prominent southern educators have stated that this estimate is very conservative. It may be stated that many of the country schools and country churches are breeding places for disease, and whatever they may do for education and religion *they are in their present insanitary condition a menace to public health*; a large number of the country schoolhouses and country churches are not provided with any privy, and children congregating at the schools by polluting the soil may spread disease to one another.

TREATMENT OF HOOKWORM DISEASE.

Treatment of this malady should be conducted under the personal direction of a physician, as the size of the dose of thymol to be given depends upon the physical condition of the patient. Every person who has the infection, even if it is so light that he does not feel serious or any effects, owes it to his fellow-men to undergo treatment. The treatment is not expensive and it can be carried out without losing time from work.

PREVENTION OF HOOKWORM DISEASE.

All persons, whether infected or not, but living in the infected area, can aid in preventing this malady. *The most important point involved is to prevent soil pollution.* As stated in the foregoing, *because of the absence of privies* many farms, schools, and churches are acting as a medium for soil pollution, resulting in hookworm disease and certain other maladies.

If there is a sewer present, it is best to construct a water-closet and connect it with the sewer. If there is no sewer, the next best thing is to construct a septic tank and a water-closet. There are many who can not afford to have a water-closet with septic tank, and under these circumstances the next best thing to do is to construct a sanitary privy and to clean it regularly. The following are the chief features of one type of this important outhouse: There should be a good floor extending under the seat as well as under the front part; a water-tight tub or barrel or galvanized pail is placed under the seat; on the bottom, inside of this receptacle, is placed a thin layer of sand or dirt each time it is emptied; the tub should be filled about one-fourth full with a 5 per cent crude carbolic-acid solution (1 part of crude carbolic acid to 19 parts of water); if economy is an important point, the tub may be filled one-fourth full of water and a cup of kerosene poured on the water, but if kerosene is used care should be taken not to throw any lighted matches into the tub; the back of the privy is provided with a hinged door, which is opened only in order to remove the tub for cleaning, while at other times it should be closed tightly in order to keep out flies and animals; the seat should be provided with hinged covers; the front door should be hinged so that it will close well, to keep out the rain; it is a good plan to place a ventilator in the roof, also one on each side near the roof, and one each side of the tub; it is desirable to screen with wire netting all of these ventilators, in order to aid in keeping out the flies.

The tub should be cleaned regularly, once or twice a week; the night soil should be burned or buried; if buried, this should not be done within 300 feet of any well, creek, spring, or other water supply. Under no circumstance should the night soil be used as top dressing on the gardens; if used at all for fertilizing purposes, it should first be allowed thoroughly to ferment, preferably in a vat, and then it should be plowed under in fields far removed from the house; while fermenting, a cup of kerosene oil should be poured into the vat in order to keep flies away; it is dangerous to dump the night soil on the manure pile, as flies breed in the manure, and if the night soil is mixed in, the flies may carry fecal material to the kitchen or dining room and infect the food with filth and with disease germs.

Still another plan is to build a vault under the privy. If this is done, it is well to pour a cup full of kerosene oil into the vault occasionally in order to repel flies.

The average privy found in the South is known as a "surface" or "dirt" privy, and is a very poor substitute for a water-closet, as it permits soil pollution.

Whatever style of closet is selected or whatever fluid is used, the chief points to be held in mind are: Prevent soil pollution; so protect the night soil that flies and other insects can not breed in it or feed upon it; and keep it out of the reach of animals of all kinds.

It lies within the power of preachers and teachers to play a very important rôle in reducing the death rate. They are the persons to whom many people look to set the example. If preachers and teachers themselves permit the yards of churches and schools to be defiled by soil pollution, it need not be thought strange if farmers permit soil pollution to occur around the homes. Further, it should be recalled that every church and every school around which soil pollution is permitted to occur may act as a disease-breeding center from which infection can be spread to the farms and homes. Further, also, not only can preachers and teachers do good by setting an example in preventing soil pollution, but if they will point out to their friends the dangers which this pernicious habit carries with it, they can be very important factors in inducing the public to institute more sanitary customs, and thereby they can be important factors in reducing the death rate.

UNITED STATES.

[Reports to the Surgeon-General, Public Health and Marine-Hospital Service.]

Reports from San Francisco, Cal.—Plague-prevention work at San Francisco, Oakland, and Point Richmond, and in Alameda and Contra Costa counties, Cal.

Surgeon Blue reports:

SAN FRANCISCO, CAL.

Date of last case of human plague: Sickened, January 30, 1908.

Date of last case of rodent plague: October 23, 1908.

Week ended July 10, 1909.

Sick inspected.....	2
Plague.....	0
Dead inspected.....	113
Plague.....	0
Premises inspected.....	1, 645
Houses disinfected.....	37
Houses destroyed.....	1
Buildings condemned.....	9
Nuisances abated.....	139
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Rats found dead.....	10
Rats trapped.....	1, 580
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Total rats taken.....	1, 590
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Rats identified:	
Mus norvegicus.....	1, 160
Mus rattus.....	65
Mus musculus.....	352
Mus alexandrinus.....	7
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Total.....	1, 584
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Rats identified as to sex:	
Male.....	597
Female.....	595
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Total.....	1, 192
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Rats examined bacteriologically.....	1, 112
Plague rats.....	0
Poisons placed.....	42, 262